



RTOS Debugger for QNX

ARM
Atom
PowerPC
SuperH
x86
XScale

- Real Time, non-intrusive Display of QNX System Resources
- Kernel and/or Application Debugging
- Debugging Several QNX Applications At Once
- Dynamic Thread Performance Measurement
- QNX Specific Evaluation of Real Time Trace Listing
- Statistical and Graphic Display of Thread Run Times
- Thread related Evaluation of Function Run Times
- Thread Stack Coverage
- PRACTICE Functions for OS Data
- QNX related Pull-Down Menu

The TRACE32 System includes a configurable RTOS debugger to provide symbolic debugging in real time operating systems. Our software package contains a ready-to-run configuration for the QNX Real Time Kernel from QNX Software Systems Ltd.

In close cooperation with QSSL, we built a high sophisticated QNX awareness, which enables you to do a most effective debugging with the TRACE32 systems on targets running QNX.

RTOS Debugging in TRACE32 with QNX

Real Time, Non-Intrusive Display of QNX System Resources

The TRACE32 RTOS debugger for QNX provides display functions to show internal information. The system resources processes, threads and libraries can be displayed, and the QNX "pidin" command is emulated. If the target allows memory reads while running, the display of all these regions

can be viewed non-intrusively in real time. The tables are updated permanently ("On The Fly"), without affecting the application at all. Moreover, these functions are still available, even when the pidin command is not linked to your software.

The screenshot displays four windows from the TRACE32 RTOS debugger:

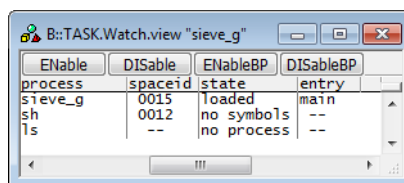
- B::TASK.Process**: A table listing system processes with columns for magic, pid, spaceid, #thr, and name.
- B::TASK.Thread**: A table listing threads with columns for magic, name, pid, tid, prio, state, and blocked.
- B::TASK.PIDIN**: A table showing the emulation of the pidin command with columns for pid, tid, name, prio, state, and blocked.
- B::TASK.Process "sieve_g" /Open**: A detailed view of the sieve_g process, showing flags, arguments, threads, siblings, code, and libraries.

Process list, detailed view of one process, thread list and pidin emulation

Kernel and/or Application Debugging

Due to the fact, that TRACE32 is a hardware debugging tool, you are able to debug anything you want, including bootstrap code, initialization phase, interrupt routines, drivers, kernel, etc. TRACE32 includes a complete MMU support, providing mechanisms to inspect the target memory using virtual addresses or physical addresses and to show the translation tables.

Additionally, TRACE32 has a special MMU support for several address spaces, which allows you to debug several QNX applications (processes) at once. An internal logic provides you with an easy access to all process memory spaces. A special process detection mechanism allows to halt the application exactly on the entry point of a process, allowing you to debug your process right from main().

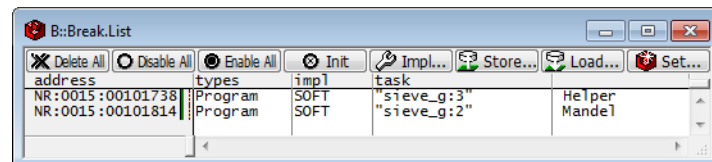


Process watch list

Thread Related Breakpoints

Any breakpoint set in the TRACE32 debugger can be set dependent to a specific thread. This means, that the

breakpoint will then only halt, if hit by the specified thread. This allows thread related debugging even in shared code.

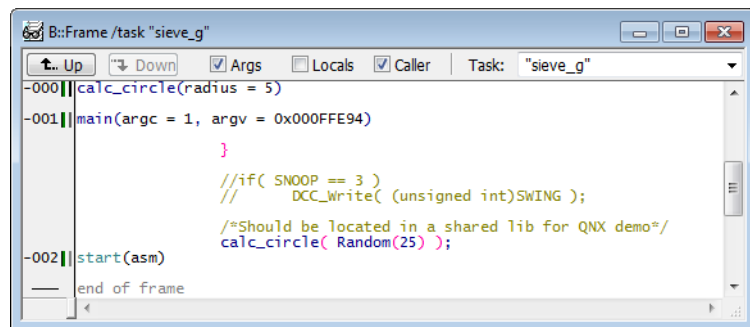


Breakpoint list window with thread specific breakpoints

Thread Context Display

The TRACE32 RTOS debugger provides an easy way to switch the current displayed context to another thread. Normally all register related windows (e.g. listing at current PC, local variables of function call stack) are dis-

played related to the actual context (i.e. current executed task). You can switch to the context of another task to see all this information at the time this task was scheduled.



```

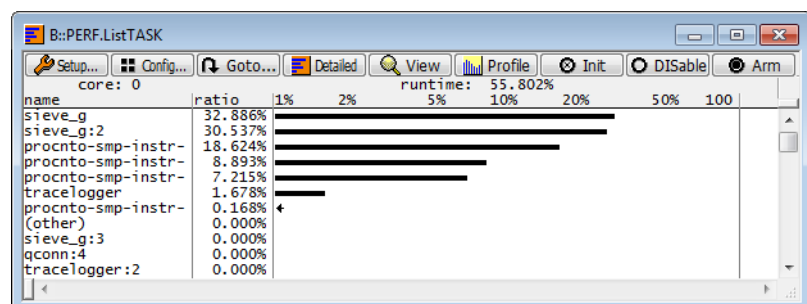
B::Frame /task "sieve_g"
-000|| calc_circle(radius = 5)
-001|| main(argc = 1, argv = 0x000FFE94)
        }
        //if( SNOOP == 3 )
        //    DCC_Write( (unsigned int)SWING );
        /*Should be located in a shared lib for QNX demo*/
        calc_circle( Random(25) );
-002|| start(asm)
        end of frame
  
```

Function call hierarchy of a specific thread

Dynamic Thread Performance Measurement

While QNX is running, TRACE32 is capable of recurrently evaluating the current running thread and collecting the results. The percentage, each thread consumes of the system, is then

displayed graphically and updated permanently. The longer time you let the measurement run, the more exact are the results. This feature is available even without any hardware trace.



Performance measurement list

QNX Specific Display of Trace Listing

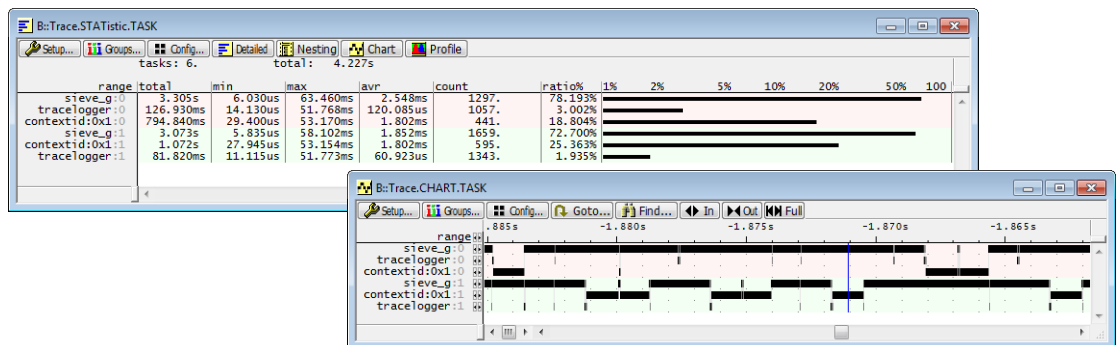
The data recorded in the real time trace buffer (if available) can be displayed and interpreted specific to the operating system. The thread switches are

displayed symbolically, either exclusively or in addition to other information.

Statistic Evaluation and Graphic Display of Thread Run Times

Out of the real time trace buffer (if available), the analyzer can calculate statistic tables of thread run times and thread switches. A graphical diagram

shows which thread was active at a specific time, giving a clear view of the behavior of the system.



Statistics and flow of threads

Thread Related Evaluation of Function Run Times

The statistic and graphic evaluation of function calls and function run times (if available) can be done dependant to the actual running thread. This is nec-

essary, if different threads call one single function at the same time, or if a thread switch occurs in between the function.

Statistic Evaluation and Graphic Display of Thread States

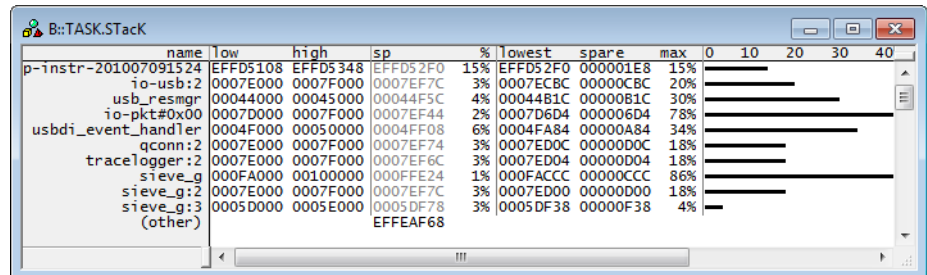
These tabular and graphical analyses of the status of threads show the various states (i.e. running, ready, waiting, suspended and undefined) and times

each thread spent in each state. A graphical view of the data can help to highlight prioritization problems, critical paths etc.

Thread Stack Coverage

In real time systems it is quite important to know, how much stack space each thread consumes. For this purpose

a special window shows the current and the maximum usage of each separate thread.



Thread stack coverage window

PRACTICE Functions for OS Data

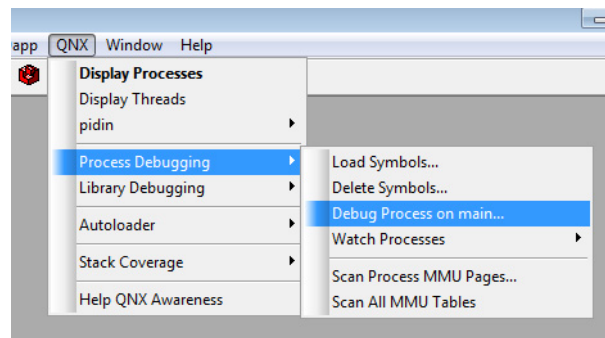
The support includes extended PRACTICE functions for process specific data. E.g. the function "task.proc.space

("hello")" returns an id specifying the MMU memory area that this process uses.

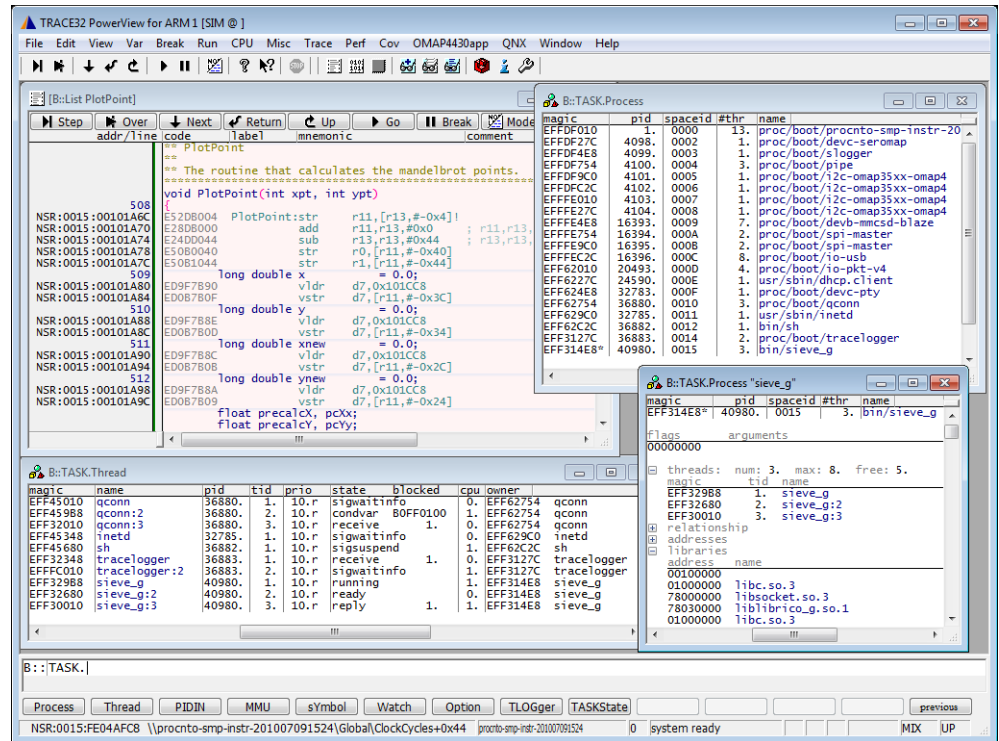
QNX Related Pull-Down Menu

Because the menu bar of the TRACE32 user interface can be fully customized, you can create a new pull down menu, including operating system specific commands. We deliver

QNX support with an example for such specific menus, which provides fast and easy access to the QNX specific features.



QNX specific menu items



TRACE32 with source/assembly window and opened QNX specific displays

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